

Captain Joseph Collier, of the s. s. "Cholmley," in the Straits of Gibraltar on the 27th, experienced heavy squalls, with thunder, lightning, and hail, during which the masts, spars, and all pointed objects were tipped with a phosphorescent light.

OPTICAL PHENOMENA.

SOLAR HALOS.

Solar halos were observed in the various states and territories, as follows:

Alabama.—10th.
Arizona.—7th to 10th.
California.—7th, 8th, 9th, 11th, 13th, 15th, 25th, 27th.
Colorado.—7th, 12th, 28th.
Connecticut.—3d, 8th, 11th, 20th.
Dakota.—1st, 8th, 14th, 16th, 17th, 18th, 20th, 23d, 26th.
Florida.—1st, 3d, 8th, 17th, 21st to 24th.
Georgia.—14th, 22d.
Idaho.—8th, 9th.
Illinois.—1st, 6th, 9th.
Indiana.—12th, 17th, 22d, 27th, 30th.
Indian Territory.—21st.
Iowa.—9th, 10th, 11th, 16th, 21st, 22d, 29th.
Kansas.—8th, 9th, 12th, 16th, 21st, 22d.
Kentucky.—12th.
Maine.—11th, 13th.
Maryland.—26th.
Massachusetts.—18th, 31st.
Michigan.—1st, 2d, 8th, 12th.
Minnesota.—4th, 19th, 23d.
Montana.—18th, 25th.
Nebraska.—17th.
Nevada.—10th, 18th.
New Jersey.—18th, 20th.
New Mexico.—16th.
New York.—2d, 8th, 15th, 16th, 18th, 20th, 23d.
North Carolina.—27th.
Ohio.—1st, 12th, 13th, 14th, 20th, 21st, 24th, 30th.
Pennsylvania.—8th, 15th.
South Carolina.—1st, 12th, 23d.
Tennessee.—1st, 6th, 9th, 14th, 17th, 20th, 30th.
Utah.—11th.
Virginia.—1st, 2d, 8th, 15th, 18th.
Washington Territory.—19th.
Wisconsin.—9th, 10th, 12th, 21st, 22d, 23d, 29th.
Wyoming.—1st, 3d, 9th to 13th, 16th, 17th.

LUNAR HALOS.

Lunar halos were observed in the various states and territories, as follows:

Alabama.—17th.
Arizona.—9th, 11th, 15th, 16th, 18th, 20th.
Arkansas.—11th, 16th, 21st.
California.—11th, 13th to 16th, 19th, 20th, 22d, 26th.
Colorado.—10th, 11th, 13th, 14th, 18th, 20th, 25th.
Connecticut.—10th, 16th, 18th.
Dakota.—1st, 13th, 14th, 16th to 20th.
District of Columbia.—12th, 20th, 22d.
Florida.—15th, 17th, 18th.
Georgia.—14th, 17th, 18th, 22d.
Idaho.—11th, 21st, 28th.
Illinois.—17th, 19th, 21st, 22d, 24th, 26th.
Indiana.—14th, 16th, 17th, 19th, 22d.
Indian Territory.—16th.
Iowa.—7th, 12th, 16th, 17th, 21st, 22d, 23d.
Kansas.—8th, 10th, 16th, 20th, 21st, 24th.
Kentucky.—14th, 17th.
Maine.—11th, 16th, 18th, 20th.
Maryland.—12th, 15th, 22d.
Massachusetts.—12th, 16th, 18th, 19th, 20th.
Michigan.—10th, 12th, 13th, 14th, 19th, 21st.
Minnesota.—13th to 18th.
Montana.—14th to 18th, 22d.

Nebraska.—15th, 16th, 17th, 22d, 25th.
Nevada.—10th, 11th, 15th, 24th.
New Hampshire.—11th, 15th, 18th, 24th.
New Jersey.—15th, 18th, 20th.
New Mexico.—10th, 11th, 13th, 15th, 16th, 17th.
New York.—8th, 14th, 15th, 16th, 18th, 20th, 21st.
North Carolina.—17th, 19th.
Ohio.—2d, 10th, 11th, 12th, 14th, 21st, 22d.
Oregon.—17th.
Pennsylvania.—12th, 15th, 19th, 20th.
South Carolina.—12th, 15th, 17th, 18th, 19th.
Tennessee.—14th, 17th, 19th.
Texas.—11th, 12th, 14th, 15th, 16th, 20th, 21st, 22d, 24th, 25th, 26th.
Utah.—25th.
Vermont.—15th, 16th, 18th, 23d.
Virginia.—12th, 13th, 15th, 17th to 20th.
Washington Territory.—15th, 19th.
West Virginia.—12th, 14th, 19th.
Wisconsin.—10th, 19th.
Wyoming.—12th, 15th, 17th, 18th.

The phases of the moon during January were: new moon, 4th, 2.35 a. m.; first quarter, 12th, 7.16 a. m.; full moon, 19th, 2.36 a. m.; last quarter, 26th, 8.23 p. m.; apogee, 6th, 4.01 a. m.; perigee, 19th, 8.02 p. m.

MIRAGE.

Cahuenga Valley, California, 30th.
 Cedar Keys, Florida, 19th.
 Harvard, Nebraska, 25th.
 Fort Grant, Arizona, 24th, 25th, 27th.
 Reidsville, North Carolina, 7th.
 Saint Vincent, Minnesota, 11th, 12th.

MISCELLANEOUS PHENOMENA.

SUN SPOTS.

Prof. David P. Todd, director of the Lawrence Observatory, Amherst, Massachusetts, furnishes the following record of sun spots for January, 1886:

Date— January, 1886. Standard time.	No. of new.		Disappeared by solar rotation.		Reappeared by solar rotation.		Total No. visible.		Remarks.
Gr'ps	Spots	Gr'ps	Spots	Gr'ps	Spots	Gr'ps	Spots		
1, 4 p. m.	1	3				2	20†		
2, 4 p. m.	1	10†	0	5†	1	10†	3	25†	
5, 3 p. m.	0	40†					2	60†	
8, 8 a. m.	1	10†					2	35†	
10, 4 p. m.	0	5†					2	40†	
11, 2 p. m.	0	0	0	0	0	0	2	40†	
12, 3 p. m.	0	15†	0	0	0	0	2	55†	
13, 2 p. m.	1	60†	0	5†	1	15†	4	110†	
14, 4 p. m.	0	10†	0	5†	0	10†	4	115†	
15, 2 p. m.	0	0	1	3	0	0	3	110†	
18, 10 a. m.	2	6					5	85†	Two spots quite large.
20, 11 a. m.	0	0			0	0	5	20†	One of the spots very large.
23, 12 m.	0	0			0	0	0	0	One of the spots very large.
26, 12 m.	0	0	0	0	0	0	0	0	Broad areas of faculae.
31, 10 a. m.	1	5	0	0			1	5	

Faculae were seen at the time of every observation.

† Approximated.

Mr. H. D. Govey, of North Lewisburg, Champaign county, Ohio, reports having observed sun spots on the following dates: 1st, 4th, 7th, 11th to 14th, 17th, 19th, 30th.

SUNSETS.

The characteristics of the sky, as indicative of fair or foul weather for the succeeding twenty-four hours, have been observed at all Signal Service stations. Reports from one hundred and sixty stations show 4,933 observations to have been made, of which four were reported doubtful; of the remainder, 4,929, there were 4,349, or 88.2 per cent., followed by the expected weather.

EARTHQUAKES.

Nashua, Hillsborough county, New Hampshire: an earthquake shock of about ten seconds' duration was generally felt in this section of the state at 5.14 p. m. of the 17th; it was accompanied by a noise similar to that made by a heavy wagon drawn rapidly over frozen ground, or deep thunder; vibration, if any, probably from north to south.

Grand Coteau, Saint Landry parish, Louisiana: a slight shock of earthquake was felt at 10.38 a. m. of the 22d.

Prof. C. G. Rockwood, jr., Princeton, New Jersey, furnishes the following account of earthquakes that occurred during January, 1886:

A slight shock of earthquake was reported at 5 a. m. of the 7th in the western part of Seneca county, New York; inquiry in these regions by circular failed, however, to discover any ground for the report. Replies received from Auburn, Romulus, Hector, and Syracuse agree that no shock was felt. Mr. J. F. Boynton, of Syracuse, says: "After diligent inquiry of many persons, I cannot give any knowledge of an earthquake here, except an announcement in a New York paper."

The New Haven (Connecticut) "Palladium," of January 14th, contained a dispatch from Winsted, Connecticut, announcing that two or three persons in the house of Rollin H. Cook felt what was supposed to be a very slight shock of earthquake at 4.15 p. m. of the 9th; it was not felt by any others, as far as known.

Guayaquil, Ecuador, January 14th: There have been, at different places, showers of earth and ashes, accompanied by loud rumblings; the volcano Cotopaxi is supposed to be in eruption; the real state of the mountain is unknown, owing to the breaking down of the government telegraph lines. Slight shocks of earthquake have also been felt.—*New York Tribune*, January 15th.

The earthquake reported from Bordentown, Hightstown, Hammonton, and Princeton, New Jersey, at 5.15 p. m. of the 15th, was due to an explosion of dynamite at Toms River, New Jersey.

The earthquake reported at Nyack, New York, about midnight of the 15th, was caused by an explosion of dynamite in Westchester county, New York.

Mexico, January 20th: A telegram from Colima was received by the government stating that on the morning of the 15th another eruption of the volcano occurred. Enormous stones were thrown to a great height and were plainly visible from this city. (Colima is twenty-five miles distant.) Photographs of the volcano at the moment of its greatest activity were taken by the instantaneous process. A vast white cloud still overhangs the crater, and on it the flames are beautifully reflected.—*New York Tribune*, January 21st.

January, 24th: In the southern part of Dutchess county, New York, a number of persons in the vicinity of Hopwell Junction and Brinckerhoffville felt, at 7.04 p. m., a shock supposed to be a slight shock of earthquake; it was sufficiently strong to rattle windows and displace light objects and was accompanied by a loud noise like a distant explosion or the rumbling of a farm wagon. Two shocks in close succession were reported, lasting about fifteen seconds. Another observer states that only one shock was felt and lasted not over two seconds. It was only felt in a very limited district and was not felt at Poughkeepsie or Kingston.

PRAIRIE FIRES.

Richardton, Dakota, 5th.

Fort Sill, Indian Territory, 23d, 24th, 29th.

METEORS.

Fort Bridger, Wyoming: meteors were observed before daylight and during the evening of the 2d.

Wytheville, Wythe county, Virginia: an unusual number of small meteors were observed at 5.40 a. m. of the 2d; the largest was of a whitish color and about the size of Jupiter; it left a trail which lasted one to two seconds.

The following description of a meteor is furnished by Rev. John G. Hagen, S. J., voluntary observer at the College of the Sacred Heart, Prairie du Chien, Wisconsin:

At 9.49 p. m. (central time) of the 16th a brilliant meteor was observed that suddenly illuminated the whole country, although the moon was nearly full; it first appeared due west of Prairie du Chien at an altitude of 40°, and moved in a southeasterly direction, describing an arc of 92°, and disappeared at an altitude of 40°, in the direction of Dubuque, Iowa, 30° east of our meridian. The highest altitude, 58°, was reached 30° west of the meridian, in the direction of Masonville, Iowa. Its path among the stars went from δ Andromedæ, near α Tauri, and α Prionis, to the star 22 Flamsteed Monocerotis. Its apparent diameter was estimated at one and a half times that of the full moon; its light was first a mild blue, which afterwards changed into red. There were three explosions, the first in the constellation of Aries, azimuth 80° west, the second at greatest height, azimuth 30° west, just below the moon, and the third in 20° eastern azimuth, shortly before it disappeared; after each explosion a trail was formed about 15° long, some fragments showed as bright as Venus; the whole phenomenon may have lasted from five to eight seconds. One of the observers thought to have heard some hissing noise, right after the explosion, but it was not until 2.2 minutes later that several loud reports were heard from the south like far distant thunder, and many faint ones in quick succession. The observer looked at his watch about half a minute after the appearance of the meteor, and, therefore, the interval of 2.2 minutes between light and sound may be uncertain within two-tenths of a minute; this would give a distance of twenty-seven miles in the air line, or thirteen miles in a horizontal direction and more than twenty miles in height. According to very vague reports, the meteor was seen in Decorah, Waukon, and Dubuque, Iowa; Lancaster, Wisconsin; and Galena, Illinois.

Mr. W. B. Sherman, voluntary observer at Manchester, Delaware county, Iowa, reports the following:

At 9.50 p. m. of the 15th (?) a meteor appeared in the northwest about 60° above the horizon and appeared to be about eight inches in diameter; it passed directly east, and when a little east of north a fragment about the size of a man's hand fell perpendicularly three degrees, which was followed shortly after by another piece similar to the first, both of which exploded like a rocket; in a few seconds the explosion was followed by a rumbling noise like distant thunder. Although the moon was shining bright, the light of the meteor was so intense that people hurried out doors to see if some building was not burning; the nebula disappeared in the northeast, 44° above the horizon.

[NOTE.—The meteor reported by Mr. Sherman was probably observed on the 16th, as the sky throughout Iowa was obscured on the 15th, and reports from other sources mention this meteor as having occurred on the 16th.—C. S. O.]

West Union, Fayette county, Iowa: a brilliant meteor was observed, moving in a southeasterly direction, at 9.45 p. m. of the 16th; two explosions occurred east of this place.

Dubuque, Iowa: a brilliant meteor, of a pale rose color, was observed at 10.50 p. m. of the 16th; it started from the northwest portion of the sky at an altitude of about 20°, and moved towards the southeast; when within 20° of the zenith it burst into three pieces.

Cedar Rapids, Linn county, Iowa: a brilliant meteor was observed at 10 p. m. of the 16th, which remained in sight for several seconds.

Mankato, Blue Earth county, Minnesota: at 9.45 p. m. of the 16th a brilliant meteor appeared in the south, moving east of south, at an altitude of 20° above the horizon, visible from fifteen to twenty seconds, at first bright yellow, then orange, and just before fading, a greenish tinge; for a brief time it made a very vivid light.

Bancroft, Kosuth county, Iowa: at 9.48 p. m. (central time) of the 17th a meteor was observed, moving about 15° south of east, lighting up the whole country like an electric light.

Meteors were also observed in the various states and territories, as follows:

Connecticut.—Bethel, 30th.
Dakota.—Webster, 3d.
Florida.—Archer, 30th.
Illinois.—Anna and Peoria, 17th.
Iowa.—Monticello, 9th, 16th, 27th; Oskaloosa, 22d; Cedar Rapids, 6th.
Kansas.—Wakefield, 5th.
Maryland.—Woodstock, 7th.
Nebraska.—Crete, 5th, 30th, 31st; Harvard, 12th.
New Hampshire.—Nashua, 12th.
New Jersey.—Dover, 2d, 22d.
Ohio.—Wauseon, 6th; Tiffin, 23d.
South Carolina.—Spartanburg, 4th, 7th.
Texas.—Midland, 28th.
Virginia.—Variety Mills, 5th; Dale Enterprise, 13th.

POLAR BANDS.

Florida.—Archer, 16th, 17th, 18th, 20th, 23d, 31st.
California.—San Diego, 16th.
Colorado.—Montrose, 15th, 27th.
Kansas.—Yates Centre, 16th.
Maine.—Portland, 13th.
Massachusetts.—Somerset, 16th.
New York.—New York City, 23d.
Ohio.—Wauseon, 1st; Napoleon, 1st, 22d.
South Carolina.—Stateburg, 1st.
Tennessee.—Nashville, 1st, 6th.
Texas.—El Paso, 18th.
Virginia.—Variety Mills, 10th; Wytheville, 1st, 12th, 13th, 15th, 17th; Dale Enterprise, 6th, 15th, 20th.
Wyoming.—Fort Bridger, 8th to 11th.

SAND STORMS.

Midland, Midland county, Texas: a heavy sand storm occurred at 10 a. m. of the 26th, during which it was impossible to see objects one hundred rods distant.

Sand storms were also reported from the following stations:
 Abilene, Texas, 26th.
 El Paso, Texas, 19th.
 Yuma, Arizona, 1st, 7th, 8th, 25th.
 Los Angeles, California, 1st.

SHOWER OF DUST.

Austin, Travis county, Texas: about 4 p. m. of the 26th, a shower of very fine dust began falling from a clear sky; there was no wind at the time; the shower increased towards evening and continued late into the night. The dust had a peculiar effect on the lungs and throat, causing irritation and hoarseness. A similar phenomenon occurred at this place eight years ago.

WATER-SPOUTS.

Captain H. L. Higgins, of the s. s. "Excelsior," reports that between latitude 28° and 30° N. and longitude 79° 50' and 79° 25' W., he passed four large and several small water-spouts.

Captain Wohlmuth, of the bark "Betty," at 5 p. m. of the 30th, when in latitude 29° 57' N. and longitude 64° 30' W., saw a water-spout moving from southwest to northeast; another was observed at 5.30 p. m.

The British s. s. "Cholmley," when twenty-eight miles north of Madeira, on the 31st, saw a water-spout traveling in a northeasterly direction at the rate of about fifteen miles per hour, and seeming to revolve very rapidly during its progress. Its duration was about fifteen or twenty minutes.

MIGRATION OF BIRDS.

Geese flying northward.—Fort Madison, Iowa, 31st; Ashwood, Tennessee, 20th; Ocean City, Maryland, 12th, 25th, 29th; Augusta, Georgia, 7th, 21st; Yuma, Arizona, 4th; Fort Bidwell, California, 31st.

Geese flying northeastward.—Eastport, Maine, 3d.

Geese flying southward.—Portland, Oregon, 28th.

Ducks flying northward.—Ocean City, Maryland, 25th.

Ducks flying eastward.—Knoxville, Tennessee, 11th.

Ducks flying southward.—Salina, Kansas, 27th; Vicksburg, Mississippi, 8th; Knoxville, Tennessee, 4th, 8th.

Meteorological record of voluntary observers and Army post surgeons, January, 1886.

The maximum and minimum temperatures at stations marked thus (*) are from readings of other than standard instruments.

Stations.	Temperature.			Rainfall.	Stations.	Temperature.			Rainfall.
	Maximum.	Minimum.	Mean.			Maximum.	Minimum.	Mean.	
<i>Alabama.</i>	°	°	°	<i>Inches</i>	<i>Connecticut.</i>	°	°	°	<i>Inches</i>
Birmingham *	62	0	7.07		Bethel	54	—18	23.4	4.72
Greensborough	65	2	39.4	10.15	Hartford	54	—17	17.6	4.60
Mount Vernon B'kws.	72	10	44.4	7.12	North Colebrook *	56	—18	22.8	5.65
<i>Arizona.</i>					Southington	56	—18	22.8	3.93
McDowell, Fort.	77	12	49.6	3.20	Voluntown				0.40
Tucson				1.61	<i>Dakota.</i>				
<i>Arkansas.</i>					Abr. Lincoln, Fort.	31	—37	—5.7	0.94
Lead Hill *	58	—13	24.2	2.45	Meade, Fort.	52	—33	—7.3	0.32
Mount Ida *	50	—4	30	2.60	Pembina, Fort.	24	—38	—11.9	2.25
<i>British Columbia.</i>					Randall, Fort.	53	—29	8.0	0.41
New Westminster.				9.43	Richardton*.	32	—40		1.10
<i>California.</i>					Sisseton, Fort.	45	—44	—4.6	0.60
Alcatraz Island.	60	40	49.1	7.00	Sully, Fort.	49	—29	2.4	0.11
Angel Island.	68	34	50.6	7.17	Totten, Fort.	32	—10	10.1	0.80
Benicia Barracks.	63	33	47.8	5.98	Vermillion *	41	—30	4.5	1.37
Bidwell, Fort.	55	—2	32.1	5.91	Webster	44	—40	0.0	1.24
Cahuenga Valley.				7.65	Yates, Fort.	35	—39	—2.4	0.26
Fall Brooke	79	31	53.5	9.76	<i>District of Columbia.</i>				
Hydesville.				7.73	Distributing Res'r's	56	—3	29.4	5.18
Mason, Fort.	61	41	52.6	4.68	Receiving Res'r's.	56	—5	28.0	4.97
Marletta *	77	21	49.5	10.66	Kendall Green.	56	—4		2.40
Nicolaus *	69	31	47.8	5.32	Rock Creek Bridge*	58	—0	32.4	
Oakland.	64	30	40.4	8.12	<i>Florida.</i>				
Oroville *	66	29	48.2	5.17	Archer *	79	14	50.0	3.24
Poway *	77	28	53.1	6.34	Limona *	82	23	56.4	2.94
Presidio of San F.	66	35	49.4	6.77	Manatee *	85	23	52.5	2.56
Princeton *	64	29	47.7	3.91	Merritt's Island.	77	20	55.3	1.96
Sacramento*	68	27	46.6	6.26	Saint Augustine, Ft.	75	17	50.3	4.30
Salinas.	68	29	49.2	5.10	Tallahassee *	72	12	49.0	4.45
San Rafael.	71	25	48.7	11.08	<i>Georgia.</i>				
Santa Barbara.	85	35	55.0	5.12	Athens	65	1	37.0	6.47
Susanville.	58	8	28.2	4.09	Forayth *	68	6	41.7	8.15
<i>Colorado.</i>					Milledgeville.	69	6	39.8	7.31
Colorado Springs	60	—20	22.0		Quitman*	72	13	47.4	3.55
Lyon, Fort.	50	—19	18.3						
Pueblo.	61	—17	21.9	0.55					

Meteorological record of voluntary observers, etc.—Continued.

Stations.	Temperature.				Rainfall.	Stations.	Temperature.				Rainfall.
	Maximum.	Minimum.	Mean.				Maximum.	Minimum.	Mean.		
<i>Idaho.</i>	0	0	0		<i>Inches.</i>	<i>Massachusetts—Con.</i>	0	0	0		<i>Inches.</i>
Boise Barracks	54	1	30.6	2.53		Heath *	50	20			
Coeur d'Alene	45	12	22.8	2.50		Leicester	51	14	20.8	6.62	
<i>Illinois.</i>						Mendon *	50	11	23.2		
Anna *	57	14	24.3	3.18		Milton	54	11	25.7	5.17	
Bloomington	55	24	2.00			New Bedford	47	9	27.2	6.74	
Bunker Hill	58	14	18.7	3.55		Princeton	49	15	20.7	5.28	
Collinsville	55	13	20.7	3.49		Somerset *	12	12	26.5	5.09	
Charleston *	55	18	21.0	2.80		Taunton	53	17	26.9	6.17	
Geneseo *	50	22	2.81			Worcester *	50	8	21.9	6.52	
Mattoon *	54	16	21.5	2.80		Westborough *	55	10	26.0	5.74	
Peoria	56	18	19.9	2.41		Williamstown	54	17	19.2	3.92	
Riley	45	26	12.4	3.60		<i>Michigan.</i>					
Rockford *	47	22	14.3	5.87		Birmingham	49	11		2.40	
South Evanston	48	24	15.6	3.33		Brady, Fort.	38	29	9.6	4.04	
Swanwick	54	11	22.1	2.63		Harrieville *	51	13		4.66	
Windsor	54	17	18.5	4.32		Hudson	49	17		1.25	
<i>Indian Territory.</i>						Kalamazoo	52	6		3.80	
Reno, Fort.	58	12	23.0			Lansing	40	12	19.0	2.27	
Supply, Fort.	59	14	21.4	0.76		Manistique	42	22	17.1	4.55	
<i>Indiana.</i>						Mottville *	42	18		1.75	
Fort Wayne *	53	7	23.8	2.50		Pontwater	49	5	19.8	3.36	
Guilford *	54	14	25.1	2.95		Thornville *	48	6	20.4	2.72	
Jeffersonville	60	12	27.0	3.69		Traverse City *	41	13		5.49	
Knightstown	54	24	24.4	2.41		<i>Minnesota.</i>					
Laconia	59	13	3.87			Minneapolis.	31	29	3.8	3.01	
Lafayette	54	23	19.1	1.75		Northfield	31	36	3.6	3.91	
LaGrange	52	17	18.7	3.90		Snelling, Fort.	30	36	3.5	1.98	
Logansport *	56	17	22.7	2.26		<i>Missouri.</i>					
Mauzy	53	23	19.2	4.27		Centreville	57	22		2.10	
Spiceland	53	18	21.9	3.75		Conception *	39	26	9.2	2.51	
Sunman *	54	20	23.2	3.54		Frankford *	52	18		3.12	
Terra Haute *	55	11	2.67			Pierce City *	60	18	21.2	2.10	
Vevay	60	14	27.0	3.57		Springfield	57	20	21.5	1.55	
<i>Iowa.</i>						<i>Montana.</i>					
Bancroft	34	28	2.3	1.40		Aasinaboline, Fort.	46	45	1.3	0.12	
Cedar Rapids a *	30	28	10.8	2.48		Ellis, Fort.	56	37	12.3	0.88	
Cedar Rapids b *	38	28	8.7			Keogh, Fort.	51	45	12.7	0.50	
Cresco	30	33	4.5	3.72		Shaw, Fort.	50	43	7.2	0.85	
Des Moines	42	27	9.0			<i>Nebraska.</i>					
Independence *	35	26	9.1	3.69		Crete	40	25	6.1	1.63	
Logan	38	28	2.60			De Soto *	35	25	7.0	2.24	
Fort Madison	48	20	2.50			Fairbury *	40	24			
Manchester	37	23	12.0	2.57		Fremont *	33	25	6.5	2.17	
Monticello *	38	28	9.8	3.35		Genoa	39	27	5.0	2.13	
Mount Vernon *	40	30	10.0			Harvard *	48	30			
Muscatoine	40	21	14.2	4.21		Hay Springs	50	31	10.4	0.55	
Oskaloosa a *	45	27	8.8	2.43		Marquette *	35			1.90	
Oskaloosa b *	39	26	1.25			Niobrara, Fort.	64	27	9.2	1.18	
West Union *	34	31	8.3	3.51		Robinson, Fort.	56	33	16.2	0.67	
<i>Kansas.</i>						Sidney, Fort.	58	20	17.2	1.30	
Allison	54	16	13.6	2.50		Stockham *	38	26	15.3	3.00	
Atchison *	38	19	12.8	1.54		Tecumseh *	46	26	11.4	2.60	
Emporia *	42	19	15.5	1.03		Yutan *	30	28	6.6	2.30	
Fort Scott	54	16	21.2			<i>Nevada.</i>					
Hay, Fort.	43	23	12.7	1.52		Halleck, Fort.				1.94	
Independence *	43	24	18.6	1.58		McDermitt, Fort.	51	1	28.9	1.59	
Manhattan	40	20	11.0	0.96		<i>New Hampshire.</i>					
Manhattan c *	41	19	13.3	2.50		Ashland				4.84	
Ninnescah *	43	16	14.3	2.00		Belmont				4.78	
Ottawa *	43	17	15.5	0.85		Bristol				6.61	
Salina *	40	15	20.9	0.02		Lake Village				4.23	
Riley, Fort.	47	25	11.2	0.58		Nashua.	51	23	22.0	5.86	
Sterling	44	18	13.7	1.45		Wier Bridge				3.93	
Topeka	48	20	1.30			Wolborough				4.99	
Wakefield *	40	17	13.4	0.55		Woodstock				4.71	
Wellington	49	17	17.6	1.53		<i>New Jersey.</i>					
Westmoreland *	57	18	0.98			Beverly *	57	4	26.7	4.20	
Wyandotte	44	20	14.0	3.62		Clayton *	49	0	26.9	5.01	
Yates Centre.	41	18	14.7	1.12		Dover *	57	10	25.0	5.59	
<i>Kentucky.</i>						Mount Pleasant	55	3	25.9	4.06	
Frankfort	59	20	27.6	3.67		Patterson *	48	4	27.0	4.61	
Penrod *	72	22				Phillipsburg *	51	6	23.9	2.92	
Richmond	58	14	26.5	4.53		Princeton	57	4	26.2	4.06	
<i>Louisiana.</i>						Readington *	56	4	30.2		
Grand Coteau	70	11	47.8	7.31		Vineland	60	2	28.0	4.27	
Liberty Hill *	70	5	39.0	4.52		<i>New Mexico.</i>					
Luling *	71	13	45.8	6.71		Bayard, Fort.	75	1	39.3	1.05	
Morgan City *	66	15	6.80			Guilmas Spring.	01	0		1.05	
Point Pleasant	64	6	37.6	15.28		Selden, Fort.	72	9	41.6	trace.	
<i>Maine.</i>						Union, Fort.	59	18	28.9	0.98	
Bar Harbor.	46	13	9.29			Wingate	53	12	27.2	2.52	
Buckfield *	50	16	6.48			<i>New York.</i>					
Cornish *	46	12	19.8	7.18		Auburn				3.82	
Gardner	49	24	19.5	0.61		Columbus, Fort.	53	3	23.0	4.39	

Meteorological record of voluntary observers, etc.—Continued.

Stations.	Temperature.				Rainfall.	Stations.	Temperature.				Rainfall.
	Maximum.	Minimum.	Mean.				Maximum.	Minimum.	Mean.		
<i>North Carolina.</i>	°	°	°	Inches		<i>Texas.</i>	°	°	°	Inches	
Chapel Hill.....	63	2	33.4			Austin *.....	73	6	42.6	0.97	
Lenoir *.....	60	12	19.6	6.50		Clark, Fort.....	86	10	47.7	0.12	
Lincolnton.....	62	7	31.1	6.19		Cleburne *.....	72	3	32.2	1.81	
Raleigh *.....	65	5	37.0	2.40		Comfort *.....	76	6	40.0	0.56	
Reidsville *.....	69	10	26.7	1.75		Concho, Fort.....	80	3	38.9	0.15	
Statesville *.....	61	8	34.8	5.97		Corrigan *.....	75	4	36.9	0.02	
Wake Forest *.....	65	2	36.0	2.99		Huntsville *.....	74	4	36.9	0.02	
Weldon *.....	63	8	34.7	2.88		Midland.....	75	4	36.9	0.02	
<i>Ohio.</i>						McIntosh, Fort.....	82	19	49.2	0.30	
Cleveland.....	54	8	24.3	3.17		Ringgold, Fort.....	99	18	52.7	0.34	
College Hill *.....	50	18	19.6	4.59		New Ulm.....	80	7	43.6	1.13	
Fostoria *.....	50	11	20.5	3.03		<i>Vermont.</i>					
Garrettsville.....	53	19	20.7	4.45		Brattleborough.....	56	17	20.9	6.47	
Hiram.....	52	10	21.1	4.34		Burlington.....	54	20	18.1	1.68	
Jacksonborough *.....	58	19	23.0	3.20		Charlotte *.....	48	20	14.0	2.90	
McConnelsville *.....	58	10	25.1	4.03		Dorset.....	54	23	18.5	2.94	
Napoleon.....	53	9	22.7	2.25		Lunenburg.....	42	22	15.0	2.65	
North Lewisburg.....	53	14	24.4	4.30		Newport.....	48	28	14.8	3.48	
Ruggles *.....	52	9	22.7	2.90		Poultney.....	56	27	16.7	3.72	
Tiffin *.....	54	9	21.5	2.43		Post Mills Village *.....	47	30	17.2	.....
West Milton.....	59	14	25.0	4.00		Stowe *.....	50	24	.....	6.00	
Wauseon.....	52	14	23.0	3.16		Stratford.....	46	26	16.0	4.60	
Westerville.....	54	12	23.3	3.16		<i>Virginia.</i>					
Yellow Springs.....	58	14	26.3	3.67		Accotink.....	62	9	29.7	4.29	
<i>Oregon.</i>						Bird's Nest *.....	57	10	35.4	3.15	
Albany *.....	57	18	38.8	9.92		Bruington *.....	57	6	.....	5.23	
Bandon *.....	54	26	42.4	13.72		Dale Enterprise *.....	60	12	28.2	5.96	
East Portland *.....	50	10	.....	5.08		Marion *.....	58	10	25.8	3.58	
Eola *.....	55	14	36.3	9.46		Monroe, Fort.....	60	8	34.3	1.92	
Klamath, Fort.....	50	13	27.8	3.62		Snowville *.....	66	6	.....	.....
<i>Pennsylvania.</i>						Summit.....	60	12	27.8	.....
Blooming Grove *.....	52	15	22.1	3.90		University of Va.....	59	12	31.0	.....
Catawissa *.....	60	13	23.2	4.50		Variety Mills.....	62	12	28.7	3.82	
Dillingersville.....	58	0	26.6	6.25		Wytheville.....	59	8	29.1	3.88	
Dyberry *.....	51	18	19.9	2.85		<i>Washington Territory.</i>					
Easton.....	56	3	25.8	4.12		Bainbridge Island *.....	54	16	37.0	6.95	
Fullington.....	56	3	25.8	4.12		Kenowick *.....	53	16	.....	2.10	
Franklin *.....	56	17	19.0	4.86		Pleasant Grove *.....	51	22	.....	2.62	
Germanstown *.....	52	3	.....	5.89		Spokane, Fort.....	46	14	19.4	1.32	
Grampian Hills *.....	50	20	19.5	4.27		Tacoma *.....	51	14	35.0	7.71	
Quakertown *.....	53	4	24.0	3.68		Townsend, Fort.....	52	9	37.7	.....
Troy.....	49	23	18.8	4.18		<i>West Virginia.</i>					
Wellsborough *.....	52	15	23.3	12.17		Clarksburg *.....	62	10	.....	2.11	
West Chester.....	56	3	25.4	5.98		Helvetia *.....	62	10	29.0	3.45	
Wysox.....	53	14	22.3	3.54		Parkersburg.....	60	12	20.4	7.217	
<i>South Carolina.</i>						<i>Wisconsin.</i>					
Aiken *.....	66	6	40.5	3.40		Embarras *.....	36	30	11.6	4.35	
Kirkwood *.....	42	1	34.2	2.61		Madison.....	35	24	11.9	3.33	
Pacolet *.....	63	2	34.2	6.95		Manitowoc.....	41	29	17.2	3.80	
Spartanburg.....	62	1	36.5	8.70		Neillville *.....	25	48	1.9	2.71	
Statesburg *.....	64	6	39.0	2.48		Prairie-du-Chien.....	35	25	11.5	3.26	
<i>Tennessee.</i>						Wausau.....	35	38	8.9	3.08	
Ashwood.....	57	7	25.0	4.30		<i>Wyoming.</i>					
Austin *.....	59	19	30.8	2.66		Bridge, Fort.....	38	10	20.4	4.19	
Milan.....	59	11	27.5	6.04		Fred Steele, Fort.....	44	23	19.0	0.28	
Paris *.....	62	14	29.2	.....		Washakie, Fort.....	56	37	15.3	0.04	
						McKinney, Fort.....	55	40	13.9	1.00	

NOTES AND EXTRACTS.

The following is an extract from the January, 1886, report of the "Alabama Weather Service," under direction of Prof. P. H. Mell, jr., Auburn:

The severe weather of the month has rendered January the most remarkable season recorded in many years. All agricultural interests suffered greatly. The oats that were growing finely at the opening of the month were totally destroyed by the cold wave that began on the 8th. Considerable stock during this period were also killed where proper protection was not given, and even in those cases where special care was shown the cattle much suffering occurred. Ice and frost were frequent, and in many sections large streams were covered with such thick ice as to permit skating. A slight fall of snow was also reported from most stations.

The precipitation was in excess from 0.2 to 2 inches.

The following notes from the observers will be of interest:

Birmingham: "On the 8th the temperature fell 42° in twenty hours, and remained below freezing six days—touching at, or near, zero on four successive mornings. The average for the six days (8–14th) was 14°. The ground was frozen to the depth of two feet or more, and ice formed four inches in thickness. Winter cabbage, carrots, turnips, leaves of mock orange, magnolia, and honeysuckle were killed. The damage to the fruit trees, if any, cannot be ascertained until spring. The high wind of the 15th did considerable damage to small buildings, and unroofed one or two large structures. On the 9th and 10th the air was filled with fine snow, which obscured the sun, giving the sky a smoky appearance."

Chattanooga: "The month of January, 1886, is one that will be long remembered by the inhabitants of Chattanooga. The mean annual January temperature is 40°, but January, 1886, was 7° below the normal, and 18° below the mean for January, 1880, also 11° below that for the corresponding month in 1882. The minimum temperature, which was 6° below zero on the 11th,

is 21° below the average of the last seven years' minimum temperatures, the lowest recorded, in 1880, being 29° above. The state of the weather being clear and cloudy, shows that there were seventeen cloudy days during the month and but fourteen clear to fair. In January, 1880, there were twenty-one clear to fair and but ten cloudy days. Also in 1885 there were twenty clear to fair and only eleven cloudy. The number of cloudy days has been exceeded but once; this was in 1882, when there was a very large amount of precipitation, almost double the usual quantity, the cloudy days numbering 22. The month just closed had 1.08 inches less than the normal amount of precipitation—the total being 6.78 inches. More than half (3.66) of this amount fell on the 2d and 3d. Snow fell on six and rain on fifteen days. There were killing frosts on five days and solar halos on the 17th and 20th. The prevailing direction of the wind was northeast and total movement 4,819 miles."

Gadsden: "On the early morning of the 8th instant the thermometer registered 33°, by 2 p. m. of that day 17°, and early in the evening 10°, making the average for the day 20°. The following morning, the 9th, a little after daylight, it registered 2° below zero, and at 7 a. m. 4° below, where it remained until something after 9 a. m. At 1 p. m. it registered 6° above zero and remained at that until after 4 p. m.; early in the evening it registered 3° above; the average for the day was 2° above. On the morning of the 10th the thermometer registered 3° below zero, by 2 p. m. 14° above, and at night 8°, making the average for the day about 6° above. On the morning of the 11th, at daylight, the thermometer registered 3° below, and at 8 a. m. 7° below zero; it reached 8° above by 2 p. m. and dropped to 2° above at night, making the average for the day 0°. On the morning of the 12th 2° below zero was registered. The average for the four days was 7°.5 above. The average for the night of the 8th was 3° above; that of the 9th, 0°, of the 10th, 0°.5 above. I found the ground frozen twelve inches by measurement, and ice upon a pond, four and one-half inches thick. The coldest day of the winter previous to these was that of December 15, 1885, when the thermometer registered 15° in the morning and 20° at night, the average for the day being 23°. The coldest day of last winter was February 11th, when the thermometer registered 0° in the morning, 22° at noon, and 18° at night. The average for the day being 14°. The average for the four coldest days of last winter was 21°. The average for the coldest night of last winter was 8°.5 above. My thermometer may not register correctly, but the comparisons, at least, are correct. The charts sent me by the Signal Service office show that the cold wave tends very decidedly to deflect upon this portion of the state, caused no doubt by the conformation of the several ranges of mountains near us, so that it is usually colder at Gadsden than at many other places in the same latitude."

Mountain View: "On Friday morning the 8th, about 1 or 2 a. m. it commenced raining. The sky was without a cloud at 11 p. m., Thursday. The wind blew from the south. About 8.30 a. m. Friday the wind suddenly shifted to the west, and it snowed for half an hour, and commenced turning cold. The thermometer at 7 a. m. was 40°; at 2 p. m. it fell to 18°, and 9 p. m. it was 9° above zero. The wind blew very hard all the evening and that night. At 7 a. m. Saturday (9th) the thermometer was —6°. It was very cold all day. On Monday (11th) at 7 a. m. the thermometer registered —4°, and continued cold all day. Everything that contained moisture, and was not protected, was frozen. January has been an exceedingly rough month; a greater extreme than we have ever known in this country."

Prattville: "The cold wave predicted for the 7th reached us at 8.30 a. m. on the 8th, and within twenty-two hours the temperature fell from 46° to 6°. The wind, which was from the west, was often severe. Clouds shut out the sun, and fine snow driven by the wind added much to the rigor of the blast. Cattle, well fed, wrapped in bagging, and stalled, suffered very much. The leaves of bay trees, and green logs in the wood-yard eight inches thick had frozen water in their centres. Just before the cold wave came a dense mist from the southwest filled the atmosphere. Shortly after this wind began to rise and soon blew with considerable violence. The immense pond connected with the factories was covered with ice on the 13th one hundred yards from the shore and five inches thick. No one remembers to have seen this condition of the pond before."

Tusculum: "On the 8th throughout the entire day it was raining, snowing, and hailing. The 9th was very cold, registering —4°. Ice formed five inches in thickness. The 10th, 11th, and 12th were bitter cold days. Everything frozen."

State summary.

Mean temperature, 37°.9; highest temperature, 68°, at Mobile, on the 21st; lowest temperature, 7° below zero, at Gadsden and Chattanooga, on the 11th; range of temperature, 75°; greatest monthly range of temperature, 69°, at Mount View; least monthly range of temperature, 56°, at Enfield; mean daily range of temperature, 12.6°; greatest daily range of temperature, 40°, at Tusculum, on the 8th; least daily range of temperature, 0°, at Centre, on the 3d; Fayette, on the 24th; and at Oswichee, on 5th.

Mean depth of rainfall, 6.63 inches; mean daily rainfall, 0.214 inch; greatest depth of monthly rainfall, 11.00 inches, at Newton; least depth of monthly rainfall, 3.17 inches, at Jacksonville; greatest daily rainfall average for state, 2.16 inches, on the 3d; greatest daily local rainfall, 4.57 inches, at Greensborough, on the 3d.

Average number of days on which rain fell, 7; average number of cloudy days, 17; average number of fair days, 6; average number of clear days, 8; warmest days, 1st, 2d, and 3d; coldest days, 8th, 9th, 10th, 11th, 12th.

Prevailing direction of wind, northwest.

The following is an extract from the January, 1886, "Weather Review of the Illinois Weather Service," under direction of